STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Structural Dynamics**		Code **1010115131010101035**
Field of study **Civil Engineering Extramural Second-cycle**	Profile of study (general academic, practical) **(brak)**	Year /Semester **2 / 3**
Elective path/specialty **Structural Engineering**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **part-time**	
No. of hours Lecture: **18** Classes: **-** Laboratory: **18** Project/seminars: **-**		No. of credits **4**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **4 100%** **4 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Students should know the integral and differential calculus and the matrix analysis. Students should know methods of static analysis of structures. Students should know a basis of dynamic analysis.
2	**Skills**	Students are able to calculate integrals and derivatives and are able to solve ordinary differential equations. Students are able to do operations on vectors and matrices, are able solve a set of linear algebraic equations. Students are able to perform the static analysis of structures.
3	**Social competencies**	Students are able to clearly describes and presents results of own works.

Assumptions and objectives of the course:

The aim of lectures is to acquaint students with modern methods of dynamic analysis of structures.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Students know methods of dynamic analysis of complex structures (in the linear range) - [[K_W03]]
2. Students know methods of dynamic analysis of frame structures with main types of dampers - [[K_W03]]
3. Students know a basis of sensitivity analysis of quantities describing dynamics of structures - [[K_W03]]
4. Students know a basis of analysis of seismically excited structures (in a linear range) - [[K_W03]]

Skills:

1. Students are able to perform typical dynamic calculation of frame structures in linear range - [[K_U004]]
2. Students are able to define a computer model of typical frame structures loaded by dynamic forces - [[K_U004]]
3. Students are able to critically check results of dynamic analysis of structures - [[K_U004]]

Social competencies:

1. Students are aware of responsibility for results of performed calculation - [[K_K02]]
2. Students are able to describe results of performed calculation and are able to formulate some conclusions - [[K_K02]]

Assessment methods of study outcomes

Valuation of project, written and oral exam

Course description

Equations of motion of structures treated as discrete systems.

Equations of motion written in terms of state variables. Models of chosen types of structures. Damping models. Free vibration analysis, dynamic characteristics of structures with and without damping. Sensitivities of natural frequencies and modes of vibration with respect to design parameters. Analysis of steady state vibration. Normal coordinates and theirs applications. Rayleigh quotients. Time integration methods. Dynamic analysis of block foundations. Tuned mass damper. Analysis of structures seismically and para-sejsmically excited.

Teaching methods: lecture - informative monographic, exercises - exercise and project methods

Basic bibliography:

1. Podstawy dynamiki budowli, Chmielewski T., Zembaty Z.: , Arkady, Warszawa, 1999
2. Dynamika konstrukcji budowlanych, Lewandowski R., Wydawnictwo PP, Poznań, 2006
3. R. Skarżyński, S. Labocha, Elementy dynamiki budowli w zadaniach, Wydawnictwo Politechniki Częstochowskiej, 2001 r.

Additional bibliography:

1. Dynamics of structures, Clough R.W., Penzien J.: , McGraw-Hill,, New York, 1993
2. Dynamics of structures, HumarJ.L.: , Balkema,, Lisse, 2000
3. Computational methods in structural dynamics, Meirovitch L., Sjthoff and Noordhoff, Alpen aan dej Rein, 1980

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	36
2. Preparation of project	22
3. Preparation to the test and exam	22

Student's workload

Source of workload	hours	ECTS
Total workload	80	4
Contact hours	36	2
Practical activities	44	2